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OIPE IAP17 NOV 03 2006 PATENT & TRADEMARK OFFICE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application No.	10/608,718
Filing Date	June 27, 2003
First Named Inventor	Richard D. Emery
Art Unit	2814
Examiner Name	Dilinh P. Nguyen
Total Number of Pages in This Submission	
Attorney Docket Number	42P16889

ENCLOSURES ***(check all that apply)***

- ☒ Fee Transmittal Form
  - ☐ Fee Attached
- ☒ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
  - ☐ PTO/SB/08
- ☐ Certified Copy of Priority Document(s)
- ☐ Response to Missing Parts/ Incomplete Application
  - ☐ Basic Filing Fee
  - ☐ Declaration/POA
- ☐ Response to Missing Parts under 37 CFR 1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s)
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☒ Appeal Communication to Board of Appeals and Interferences
- ☐ Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- ☐ Proprietary Information
- ☐ Status Letter
- ☒ Other Enclosure(s) *(please identify below):*

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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	Mark C. Van Ness, Reg. No. 39,865 BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP
Signature	
Date	October 31, 2006

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Signature		Date	**October 31, 2006**

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FEE TRANSMITTAL for FY 2005

Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27.

TOTAL AMOUNT OF PAYMENT	($)

Complete if Known	
Application Number	10/608,718
Filing Date	June 27, 2003
First Named Inventor	Richard D. Emery
Examiner Name	Dilinh P. Nguyen
Art Unit	2814
Attorney Docket No.	42P16889

METHOD OF PAYMENT *(check all that apply)*

☐ Check ☐ Credit card ☐ Money Order ☒ None ☐ Other (please identify): _____

☒ Deposit Account Deposit Account Number: 02-2666 Deposit Account Name: Blakely, Sokoloff, Taylor & Zafman LLP

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FEE CALCULATION

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet.	
2053	130	2053	130	Non-English specification	
1251	120	2251	60	Extension for reply within first month	
1252	450	2252	225	Extension for reply within second month	
1253	1,020	2253	510	Extension for reply within third month	
1254	1,590	2254	795	Extension for reply within fourth month	
1255	2,160	2255	1,080	Extension for reply within fifth month	
1401	500	2401	250	Notice of Appeal	
1402	500	2402	250	Filing a brief in support of an appeal	
1403	1,000	2403	500	Request for oral hearing	
1451	1,510	2451	1,510	Petition to institute a public use proceeding	
1460	130	2460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
1809	790	1809	395	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	790	2810	395	For each additional invention to be examined (37 CFR § 1.129(b))	

Other fee (specify) _____

SUBTOTAL (2) ($)

SUBMITTED BY Complete (if applicable)

Name (Print/Type)	Mark C. Van Ness	Registration No. (Attorney/Agent)	39,865	Telephone	(503) 439-8778
Signature				Date	10/31/06

Based on PTO/SB/17 (12-04) as modified by Blakely, Sokoloff, Taylor & Zafman (wlr) 12/15/2004.
SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450

Our Docket No.: 42P16889

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	
	)	
Richard D. Emery	)	Examiner: NGUYEN, DILINH
	)	
Application No: 10/608,718	)	Art Unit: 2814
	)	
Filed: June 27, 2003	)	
	)	
For: Fabrication of Microelectronic Devices	)	
	)	

Mail Stop Appeal
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF
IN SUPPORT OF APPELLANT'S APPEAL

Sir or Madam:

Appellant hereby submits this Brief in support of its appeal from an Office Action by the Examiner, mailed May 31, 2006, in the above-referenced Application. Appellant respectfully requests consideration of this appeal and the allowance of the above-captioned patent application.

An oral hearing is not requested.

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Name of Person Mailing Correspondence: Mark C. Van Ness

Signature

10/31/06
Date

TABLE OF CONTENTS

(i) REAL PARTY IN INTEREST

The invention is assigned to Intel Corporation of 2200 Mission College Boulevard, Santa Clara, California 95052.

(ii) RELATED APPEALS AND INTERFERENCES

To the best of Appellant's knowledge, there are no appeals, interferences, or judicial proceedings related to the present appeal that are related to, will directly affect, will be directly affected by, or will have a bearing on the Board's decision.

(iii) STATUS OF THE CLAIMS

Claims 1, 3-10, and 31-37 are currently pending in the above-referenced application, with claims 2 and 11-30 being canceled. In the Office Action mailed May 31, 2006, claims 1, 3, 4, and 6-10 were rejected, 5 was objected to, and claims 31-37 were allowed.

Claims 1 and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent No. 4,415,025 of Horvath (hereinafter referred to as *Horvath*).

Claims 1, 4, and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent No. 6,081,037 of Lee, et al. (hereinafter referred to as *Lee*).

Claims 1 and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent Application Publication No. 2002/0185728 of Turner (hereinafter referred to as *Turner*).

Claims 3 and 7-10 are rejected under 35 U.S.C. §103 (a) as being unpatentable over *Horvath*, *Lee*, or *Turner* in view of U.S. Patent Application Publication No. 2002/0171144 of Zhang, et al. (hereinafter referred to as *Zhang*).

The Examiner has objected to claim 5 as being dependent upon a rejected base claim. The Examiner has objected to claims 4, 6, and 31 because of informalities in the claims. The informalities are addressed in a pending amendment, but it is submitted that allowance of the amendments is not necessary for consideration of the current appeal.

(iv) STATUS OF AMENDMENTS

An amendment to the claims has been filed solely to incorporate wording changes requested by the Examiner in claims 4 and 31 to correct informalities in the claims. Applicant is requesting the entry of this amendment.

However, it is submitted that the current claims without entry of the amendments are clear for appeal, and thus the amendments are not required for purposes of the appeal, if it is determined that the amendment is not proper at this time. The only changes suggested are changing "the plate" to "the first plate" in claims 4 and 31. The relevant claims only refer to the first plate, and thus the meaning of the claims is clear. (The claims presented in the Appendix are the current claims, without entry of this amendment.)

Appellants filed a timely Notice of Appeal on August 31, 2006. The Notice of Appeal was in the form of a reinstatement of the prior appeal in this matter.

(v) SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention generally relates to microelectronic devices, and specifically to a microelectronic device that affects expansion characteristics. (See Field of the Invention, ¶ 0001).

An embodiment of the invention may be understood by referring to Figures 2 and 3 and the supporting text of the specification. In Figure 2, a package 200 is illustrated, with the package including solder bumps 220 to provide a connection to the die 240. The package 200 may include a first plate 225, which in this instance surrounds the die 240. In this illustration, the first plate 225 is coupled with the die 240 by a material, such as a stiff solder, that provides a secure physical connection. (*See* Description, ¶0028) In this illustration, the first plate 225 modifies the apparent coefficient of thermal expansion. In one example, as temperatures increase and the first plate 235 expands, the die 235 is forced to expand by the forces pulling on the die 235 at the points of attachment between the die 235 and the first plate 225 on the edges of the die 235. The package may also include a second plate 230 that is coupled with the package 200 by an adhesive, with the connection to the second plate modifying the coefficient of thermal expansion of the package. (*See* Description, ¶0029)

Figure 3 then illustrates an embodiment of the invention that includes a package 300 again with a die 340. In this embodiment of the invention, a first plate 325 is coupled with the die 340, in this instance is coupled with one side (such as the inactive side) of the die 340. The coupling is accomplished using a material providing a strong connection to the die, such as a stiff solder. A second plate 330 may also be attached to the package 300, such as by an adhesive. (*See* Description, ¶0030)

In Figures 2 and 3, the first plate and the second plate are constructed of materials that are chosen to match the apparent coefficient of thermal expansion of a die with the coefficient of thermal expansion of a package. (*See* Description, ¶0031)

(vi) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1 and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent No. 4,415,025 of Horvath (hereinafter referred to as *Horvath*).

Claims 1, 4, and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent No. 6,081,037 of Lee (hereinafter referred to as *Lee*).

Claims 1 and 6 are rejected under 35 U.S.C. §102 (e) as being anticipated by U.S. Patent Application Publication No. 2002/0185728 of Turner (hereinafter referred to as *Turner*).

Claims 3 and 7-10 are rejected under 35 U.S.C. §103 (a) as being unpatentable over *Horvath*, *Lee*, or *Turner* in view of U.S. Patent Application Publication No. 2002/0171144 of Zhang, et al. (hereinafter referred to as *Zhang*).

The Examiner has objected to claim 5 as being dependent upon a rejected base claim, and such claim would be allowable if the base claim is allowed.

Claims 31-37 have been allowed and are not the subject of this appeal.

(vii) ARGUMENT

The Examiner has rejected the claims under various references. It is submitted that numerous references that are not relevant to the claims have been cited in the multiple office actions in this matter. When the Applicant has disposed of a reference in a response, more references of the same type have been cited. In particular, the references cited generally refer to the subject of heat dissipation, which is not relevant to the claims.

In order to bring this process to a conclusion, the Applicant by this appeal wishes to demonstrate that the cited references, and any other references of this same type, do not teach or suggest the elements of the claims presented.

(a) The thermal conduction element provided in *Horvath* is not relevant to the claims

The Examiner rejected claims 1 and 6 under 35 U.S.C. 102(e) as being anticipated by *Horvath*. Appellant respectfully submits that such claims are not anticipated by the reference, and that the claims should be allowed.

Claim 1

Independent claim 1 reads as follows:

1. A microelectronic device comprising:
   a die, the die comprising a first side, a second side, and an edge;
   a first plate, the first plate coupled with the die, the first plate exerting force on the die to modify the effective coefficient of thermal expansion of the die; and
   a package, the die being coupled with the package.

This claim includes a first plate, with "the first plate exerting force on the die to modify the effective coefficient of thermal expansion of the die". It is respectfully

submitted that none of cited references teaches or suggests this claim element. The cited references do not address a plate exerting force on a die to modify the effective coefficient of thermal expansion of the die.

Appellant respectfully submits that *Horvath* does not anticipate this element of the claim. *Horvath* addresses a thermal conduction element for semiconductor devices, which is not relevant to exertion of force on a die. The conduction of heat away from a die does not exert force on the die. Further, the conduction of heat does not modify the effective coefficient of thermal expansion of a die, but rather reduces the heat applied to a die. The reduction of heat may reduce expansion, but does not modify the effective coefficient of thermal expansion.

As shown in Figure 1 of *Horvath*, the element in question is a disk shaped thermal bridge that is intended to conduct from a device to a cold plate. As stated in *Horvath*, the claimed invention is a conduction element for cooling semiconductors. "The invention is an improved cooling element adapted to be positioned between a solder bonded semiconductor device and a module cap or cold plate to form a heat conduction bridge between the device and the cap or cold plate." (*Horvath*, col. 2, lines 38-40)

The operation of the device in *Horvath* is further shown by an examination of the structure illustrated in Figures 1 and 3. As illustrated, a semiconductor (also referred to as device) 12 is connected to a substrate 10 by solder connections, and is connected to a thermal element 24, which conducts heat to a cap 16. The connection is in the form of a coating 32 (as shown in Figure 3) of a low melting alloy, preferably lead (Pb). (*Horvath*, col. 4, lines 24-33) An alternative is a thin layer of thermal grease. (*Horvath*, col. 4, lines 38-40) It is apparent from such construction that the issue involved is the conduct of heat, and not exertion of force. The use of a lead alloy or grease does not appear to

provide a conduct that would allow any exertion of force. The only mention of force appears to be a very different issue, which is the construct of slots on the thermal element in a manner that will not exert too much force on the semiconductor. "The number of slots and the length relative to the diameter of the element is dictated by the thickness of the disk and also the permissible force that can be exerted on semiconductor 12." (*Horvath*, col. 3, lines 50-54)

Thus rather than address a force exerted to modify the coefficient of thermal expansion, Horvath has provided an apparatus for conducting heat away from a semiconductor device. Thus, *Horvath* has also chosen a very different approach to addressing thermal expansion, and this reference has no relation to the elements of the claims that are at issue here. As stated previously, conducting heat away simply cools a device – it does not modify its coefficient of thermal expansion. Thus, it is submitted that Horvath does not address modification of a coefficient of thermal expansion.

(b) The packaging for thermal conduction provided *Lee* is not relevant to the claims

The Examiner rejected claims 1, 4, and 6 under 35 U.S.C. 102(e) as being anticipated by *Lee*. Appellant respectfully submits that such claims are not anticipated by the reference, and that the claims should be allowed.

Lee relates to a semiconductor component having a semiconductor chip mounted to a chip mount. However, there is no indication in *Lee* of any teaching or suggestion of a plate that is to exert a force to on a die to modify the effective coefficient of thermal expansion of the die.

Lee is intended to provide "a method for packaging a semiconductor chip into a semiconductor device that has a superior thermal performance." (*Lee*, col. 1, lines 52-54)

The intent of such package is conduction of heat, not the exertion of force to modify a coefficient of thermal expansion. "A thermally conductive chip mount has a chip receiving area thermally coupled to the chip. The heat generated in the chip can dissipate to the chip mount through the sides of the chip. Compared with a conventional heat sink mounted on the back side of a flip chip, the chip mount of the present invention has a low profile." (*Lee*, col. 1, lines 60-65)

Thus, again Lee is concerned with heat conduction, and not with the exertion of force on a die to modify the effective thermal coefficient of expansion.

(c) The thermal transfer plate provided in *Turner* is not relevant to the claims

The Examiner rejected claims 1 and 6 under 35 U.S.C. 102(e) as being anticipated by *Turner*. Appellant respectfully submits that such claims are not anticipated by the reference, and that the claims should be allowed.

Turner addresses a thermal transfer plate for coupling a thermal hardware element to an integrated circuit package. The plate presented in *Turner* is of a particular design that may be mounted in such a way as to address tolerance issues. Each footpad includes a spring zone 36 and a standoff member 40. As described in *Turner*, the standoff members and footpads are connected to the plate via the spring zones, which permit depression of the footpads towards the substrate during installation. (*Turner*, ¶0017) The intent of the design is to provide that force caused by, for example, dropping the product is transferred to the substrate without disturbing the position of the plate. Further, the design is intended to compensate for tolerance variations. (*Turner*, ¶0018)

Thus, rather than address a physical force to thermal expansion, *Turner* has provided an apparatus for attaching a thermal plate, which then would conduct heat away

from a device. In this case, *Turner* is not actually concerned with thermal expansion at all. Rather, *Turner* is concerned with a method of attaching a thermal plate in a spring-loaded fashion that will withstand dropping and reduce tolerance issues.

Thus, *Turner* does not address the exertion of force on a die to modify the effective coefficient of thermal expansion.

Other Claims

The remaining rejected claims rejected as being anticipated by *Horvath, Lee* or *Turner*, claims 4 and 6, while having other differences, are dependent claims and are allowable as being dependent on the allowable base claim. Appellant respectfully submits that absent any suggestion in this or any other reference of record, the respective claims are not anticipated.

(d) The heat spreader provided in *Zhang* is not relevant to the claims

Claims 3 and 7-10 are rejected under 35 U.S.C. §103 (a) as being unpatentable over *Horvath*, *Lee*, or *Turner* in view of *Zhang*.

Claims 3 and 7-10, while having other differences, are dependent claims and are allowable as being dependent on the allowable base claim.

Horvath, Lee and *Turner* are discussed above. It is submitted that *Zhang* does not teach or suggest the claim element missing from the other references, and thus any combination of the references thus cannot teach or suggest the elements of the independent claim.

It is submitted that *Zhang* does not provide for a plate exerting forces on a die to modify its effective coefficient of thermal expansion. Zhang describes a grid array package with a heat spreader. (Zhang, e.g. ¶0002) The head spreader is intended to

improve the thermal and electrical performance of a package. (Zhang, ¶¶0013, 0053) *Zhang* is concerned with thermal and electrical performance, not with affecting the coefficient of thermal expansion of the die.

Zhang does mention mentions coefficient of thermal expansion in paragraph 0065, but in a completely different context:

> [0065] In an embodiment, stiffener or ring 502 is attached to the top surface of substrate 104. Ring 502 may be attached to substrate 104 by a laminate or adhesive 510. Encapsulant 116 is filled in and flushed to ring 502 after the attachment of ring 502. Ring 502 is preferably made of a metal, such as copper or aluminum, or a combination thereof, but may also be constructed from other applicable materials. *Preferably, ring 502 is made from the same material as heat spreader 504, to minimize the mismatch of the thermal expansion coefficients.* Ring 502 is preferably flush with the outer edges of substrate 104 to form an outer edge of the BGA package, but may also reside entirely within or partially outside an outer profile of substrate 104.

(emphasis added) *Zhang* is indicating that a ring 502 may be attached to the top surface of the substrate, and that it is preferable to match the coefficient of thermal expansion of the ring and the heat spreader. Therefore, Zhang is only suggesting that the coefficient of thermal expansion values of these structures that are added to the die should match. It is thus submitted that the provisions in *Zhang* have no relevance to the coefficient of thermal expansion of the die.

CONCLUSION

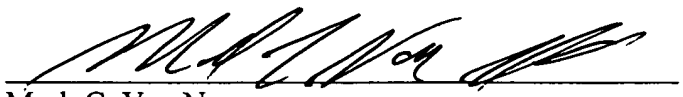
Careful review of the Examiner's rejections shows that the Examiner has failed to provide any reference or combination of references that shows the claims. Therefore, Appellant respectfully submits that all appealed claims in this application are patentable and were improperly rejected by the Examiner during prosecution before the United States Patent and Trademark Office. Appellant respectfully requests that the Board of Patent Appeals and Interferences reverse the Examiner and direct allowance of the rejected claims.

Because this is a resubmittal of a brief in a reopened appeal, it is Applicant's understanding that no fee for the filing of the brief is due. Please charge any shortages and credit any overcharges to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: October 31, 2006



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(viii) CLAIMS APPENDIX

The claims on appeal read as follows. (The claims herein do not include claim modifications suggested in the amendment currently pending.)

1. A microelectronic device comprising:

a die, the die comprising a first side, a second side, and an edge;

a first plate, the first plate coupled with the die, the first plate exerting force on the die to modify the effective coefficient of thermal expansion of the die; and

a package, the die being coupled with the package.

2. (Cancelled)

3. The microelectronic device of claim 1, where the first plate modifies the coefficient of thermal expansion of the die to make the coefficient of thermal expansion of die more closely match the coefficient of thermal expansion of the package.

4. The microelectronic device of claim 1, wherein the first plate comprises a hole, the die fitting within the hole, the edge of the die being coupled with an edge of the plate by the hole.

5. The microelectronic device of claim 4, wherein the edge of the die is soldered with the edge of the first plate.

6. The microelectronic device of claim 1, wherein a side of the die is coupled with a side of the first plate.

7. The microelectronic device of claim 1, further comprising a second plate coupled

with the package.

8. The microelectronic device of claim 7, wherein the package is attached with the second plate by an adhesive.

9. The microelectronic device of claim 7, wherein the first plate and second plate are constructed of the same material.

10. The microelectronic device of claim 9, wherein the first plate and the second plate are constructed of copper.

11-30. (Cancelled)

31. A microelectronic device comprising:

a die, the die comprising a first side, a second side, and an edge;

a first plate, the first plate coupled with the die, the first plate comprising a hole, the die fitting within the hole, the edge of the die being coupled with an edge of the plate by the hole, the edge of the die being soldered with the edge of the first plate; and

a package, the die being coupled with the package.

32. The microelectronic device of claim 31, wherein the first plate exerts forces on the die to modify its effective coefficient of thermal expansion.

33. The microelectronic device of claim 32, where the first plate modifies the coefficient of thermal expansion of the die to make the coefficient of thermal expansion of die more closely match the coefficient of thermal expansion of the package.

34. The microelectronic device of claim 31, further comprising a second plate coupled with the package.

35. The microelectronic device of claim 34, wherein the package is attached with the second plate by an adhesive.

36. The microelectronic device of claim 35, wherein the first plate and second plate are constructed of the same material.

37. The microelectronic device of claim 36, wherein the first plate and the second plate are constructed of copper.

(ix) EVIDENCE APPENDIX

None.

(x) RELATED PROCEEDINGS APPENDIX

None.